

From Ground Truth to Semantic Conformance Testing

Demonstrated by the Example of Face Image Data

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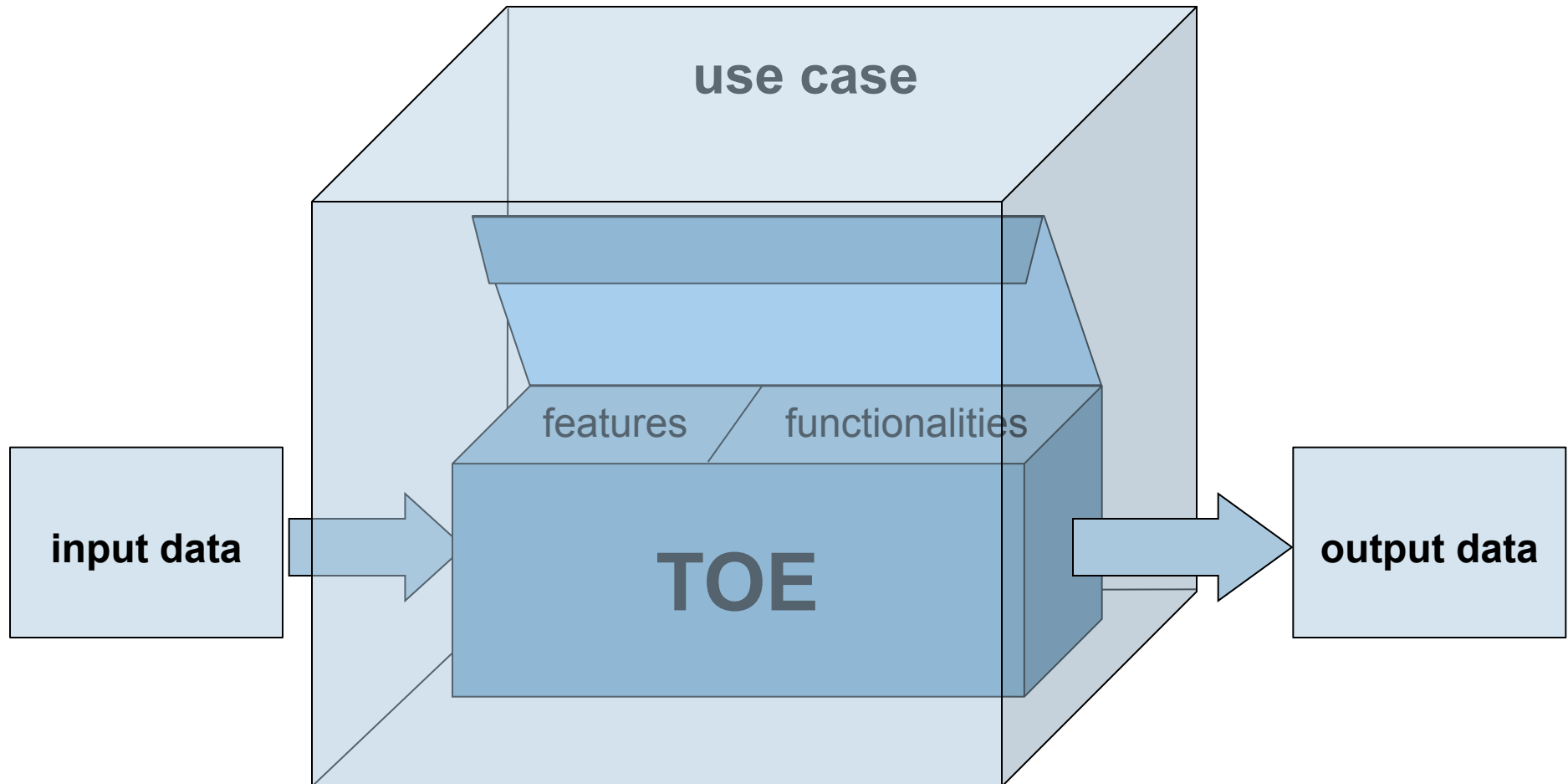
IBPC2010 / 03-04-2009, Gaithersburg (USA)

Agenda

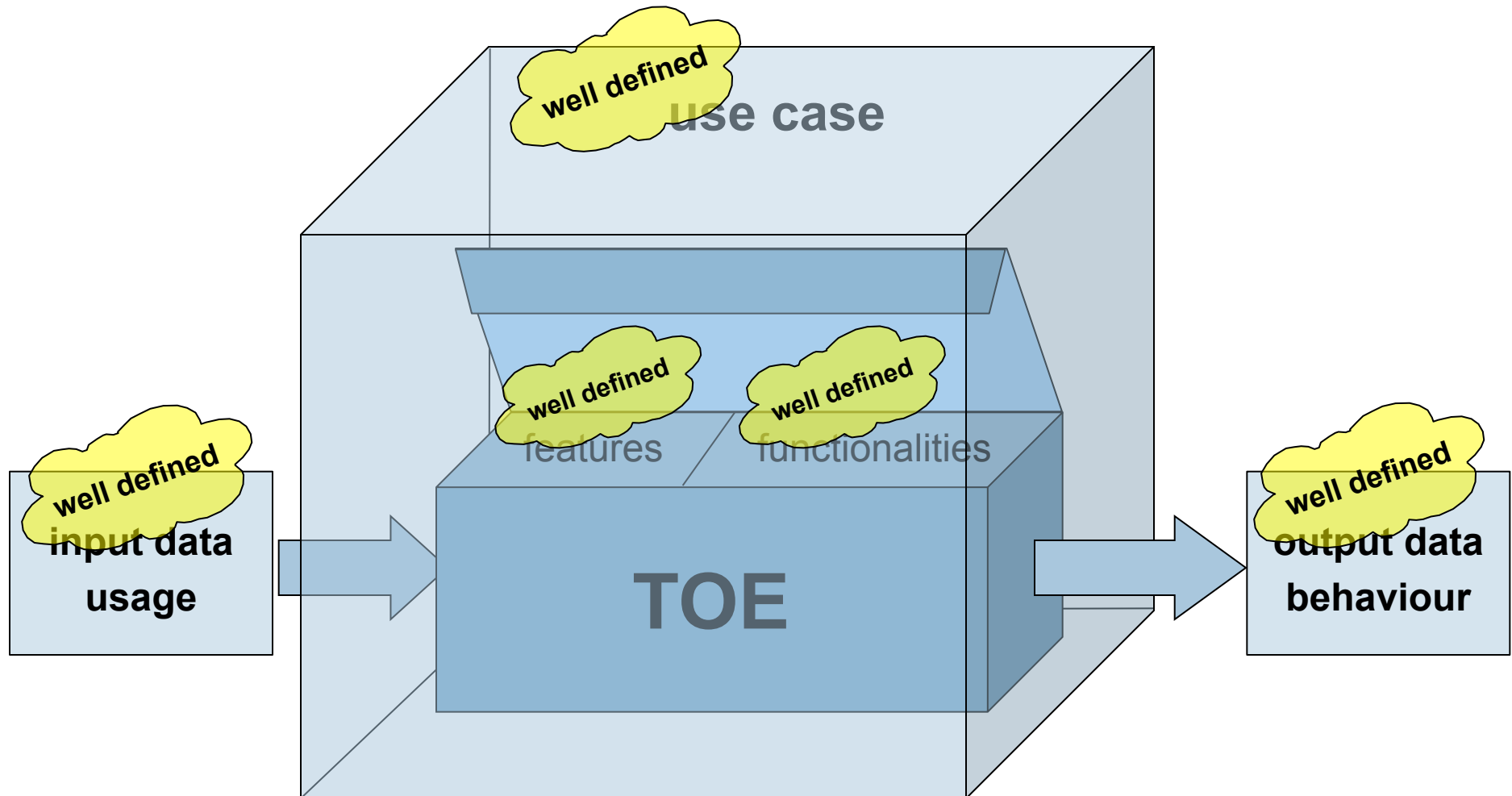


- ☐ Conformance Testing
- ☐ Ground Truth
- ☐ Practical Approach
- ☐ Conclusion

Conformance Testing - Principles -

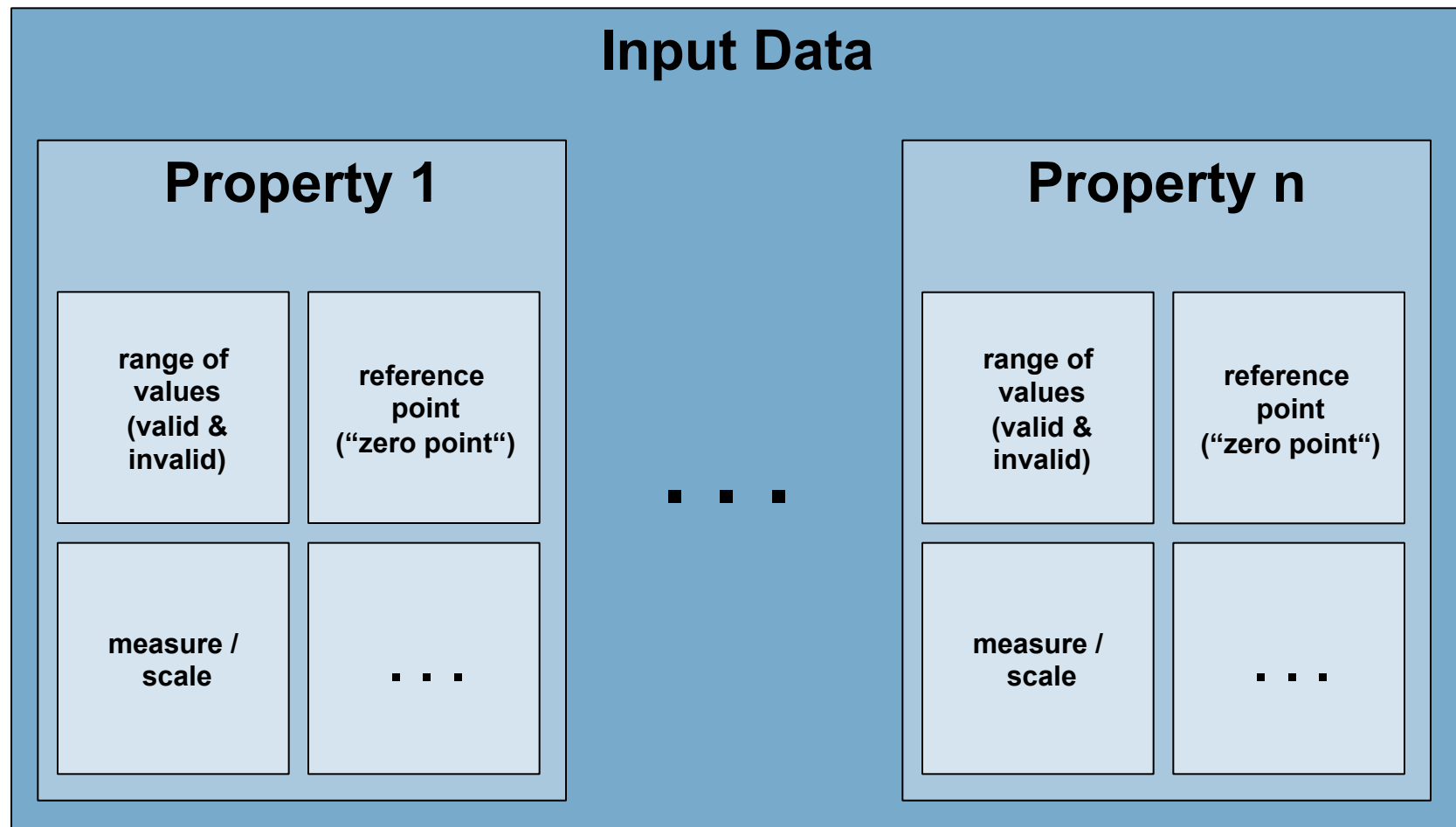


Conformance Testing - Requirements -



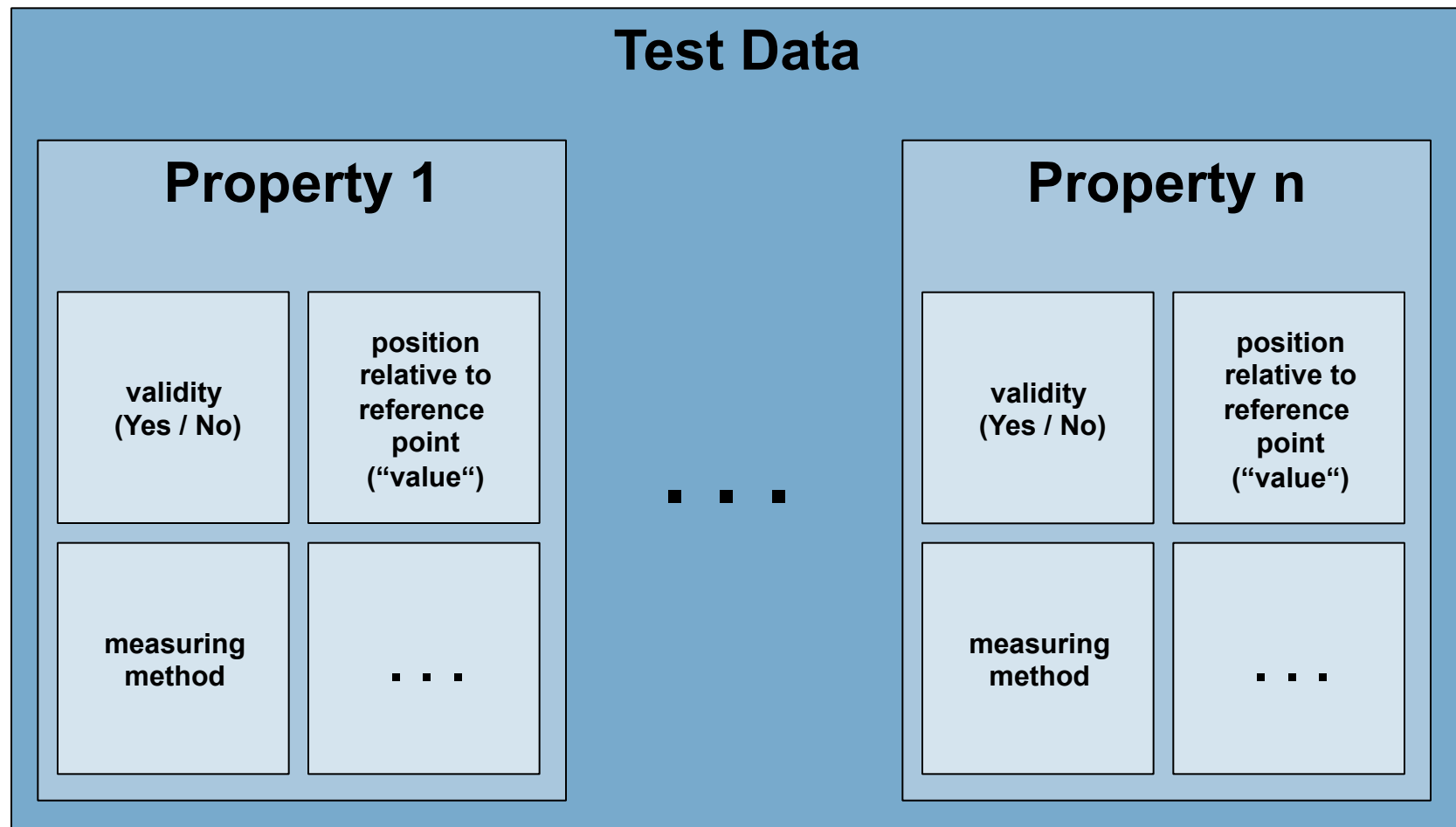
Conformance Testing

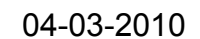
- Specification Requirements -



Conformance Testing

- Test Data Requirements -





Ground Truth - Definition -

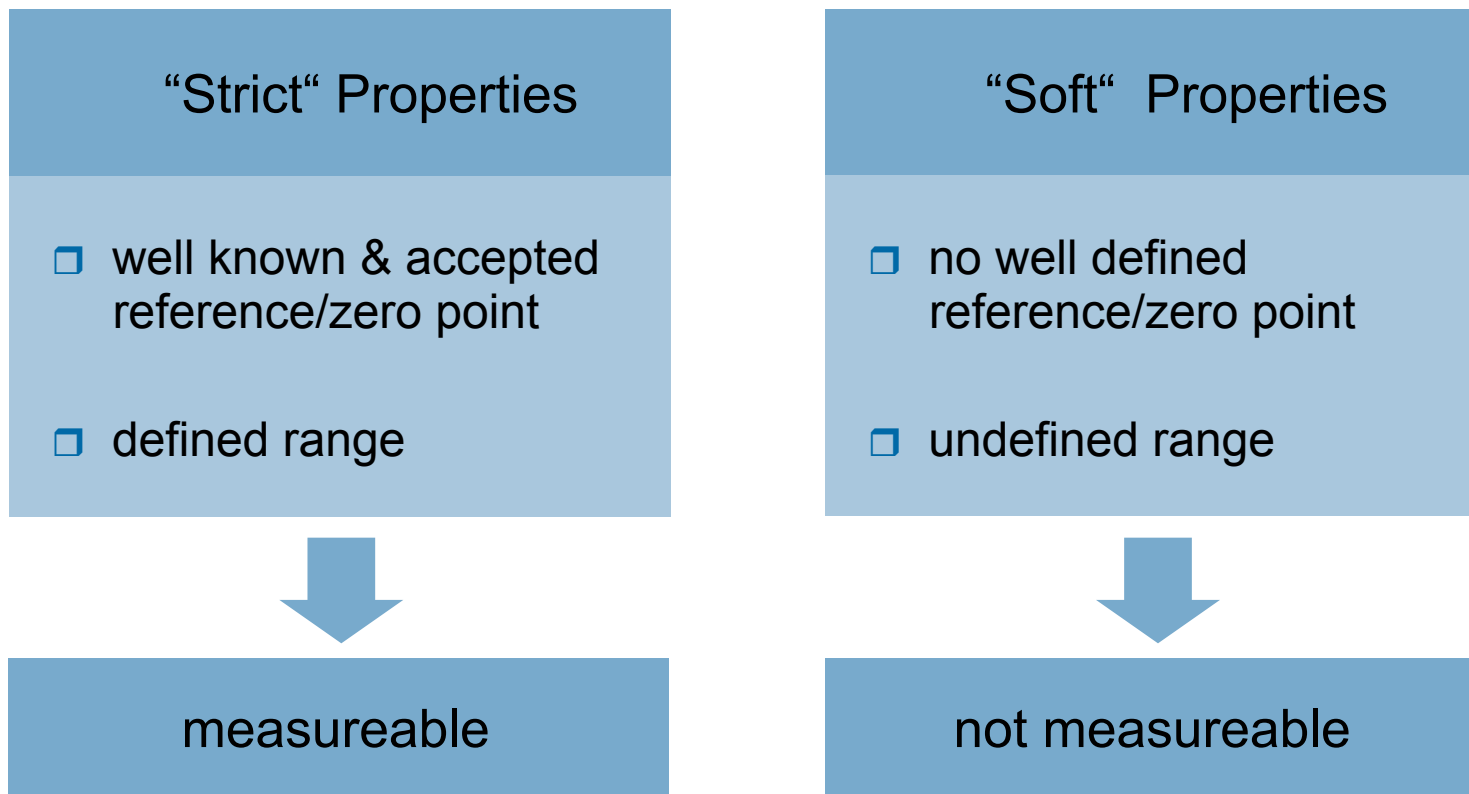


Definition of Ground Truth in Biometrics

“Ground truth” is reliable biometric data captured within a ***defined setup*** with known parameters and combined with ***additional metadata*** that describes the properties of the biometric data determined by ***defined and documented mechanisms*** and/or scientific experts.

Ground Truth - Measurability -

Characteristics of Standardized Properties



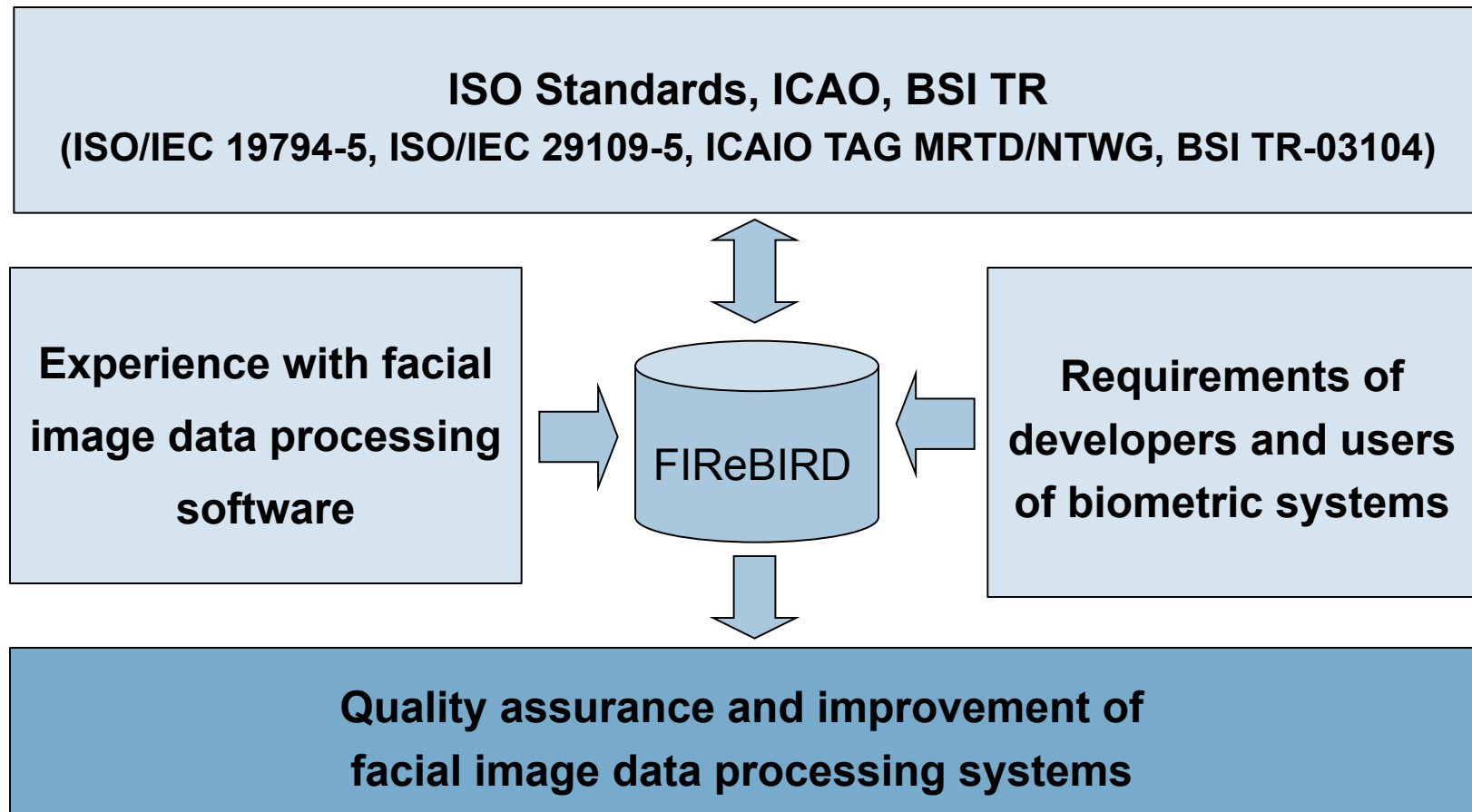
Ground Truth

- Measurability Requirements -



- ☐ measure has to be close to reality
- ☐ measure has to be internationally reproducible
- ☐ measure has to be applicable
- ☐ reference points have to be clearly separated from each other

Practical Approach - Project Idea -



Practical Approach - Realization -

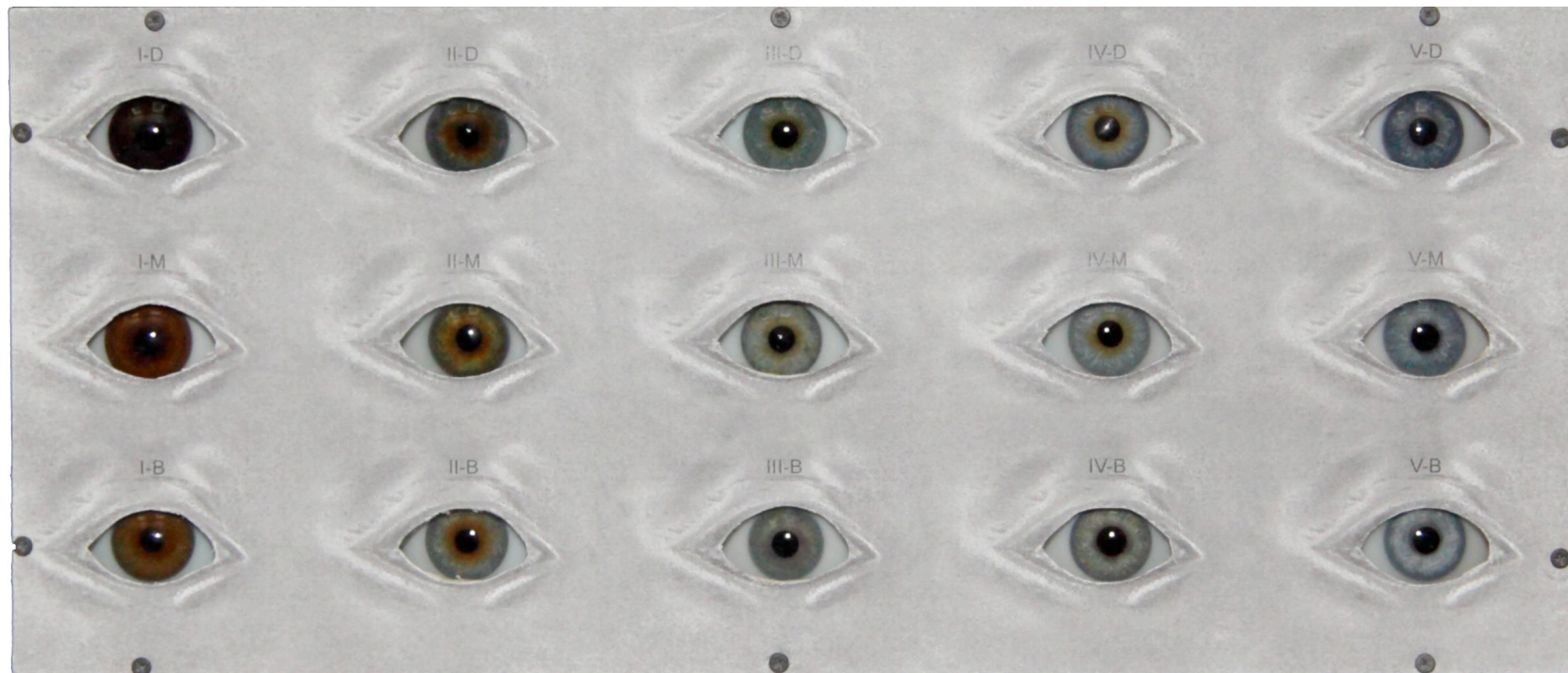


Acquisition of valid and invalid images (according to ISO/IEC 19794-5)

E. g. in respect to

- ❑ head gear, sun glasses, eye patches
- ❑ pose angles (pitch, yaw and roll), expressions
- ❑ lighting, shadows, under and over exposure, focus

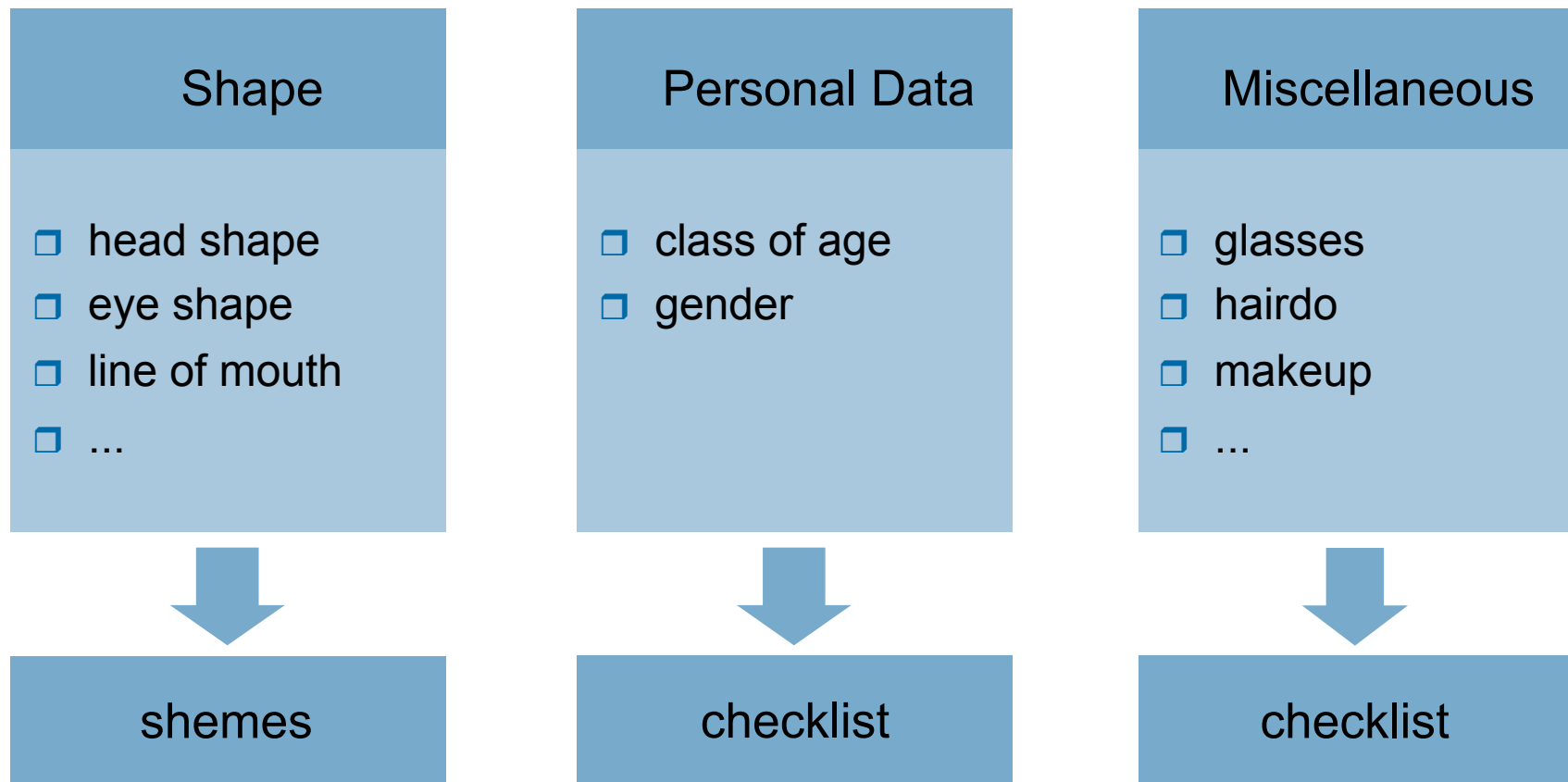
Practical Approach - Eye Color Table -



IGD



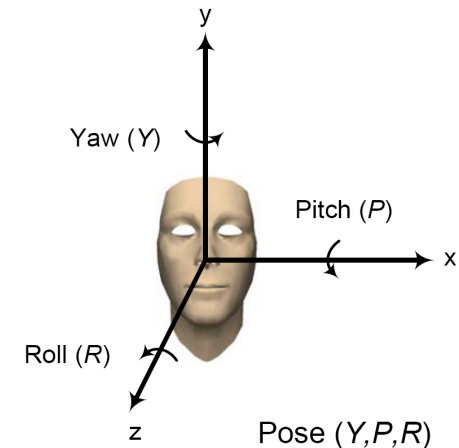
Practical Approach - Miscellaneous Data -



Practical Approach - Handling “Soft” Properties I -

Pose Variation – Looking for the Zero Point

- absolute zero point not defined
- aid: Frankfurt Plane
- problem: usually covered feature points
- extreme pose variation = killer for facial image processing
- standard has yet no answer



Practical Approach

- Handling “Soft” Properties II -



15 x SLR cameras

- ❑ 1 central camera for full frontal view
- ❑ 8 cameras for vertical variation (pitch): ± 4 , ± 10 , ± 20 and ± 45 degrees
- ❑ 6 cameras für horizontal variation (yaw): ± 4 , ± 10 and ± 20 degrees

3 x 3D scanner

- ❑ complete scan of the whole face
- ❑ no holes due to shadowing effects or occlusions

Conclusion

- Quality Of Testing -



Quality of testing depends on ...

- ☐ quality / accuracy of specifications (standards, guidelines)
- ☐ quality of test methods
- ☐ reliability of test data.

Conclusion

- Precision In Specification -



Lacking precision in specification causes ...

- ☐ less exact measurements
- ☐ vague conformance estimations

Conclusion

- Lack Of Measure -



Lack of measure hinders ...

- ☐ development of conformant systems
- ☐ production of conformant data

Conclusion

- “Zero Point” -



A scientifically defined “zero point” is needed to ...

- ☐ become a property measurable
- ☐ get a defined scale for measurement
- ☐ get comparable measurements
- ☐ determine whether a property is in line with a standard

Conclusion

- Standardization Demands -

Standardization has (at least) to define ...

- ☐ a scale
- ☐ a reference point (or “zero point“)
- ☐ value ranges

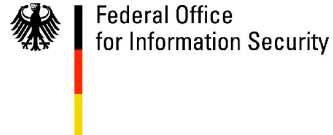
for every property / feature it deals with.

Thank You

For Your

Attention !

Contact



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